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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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30827	7590	05/16/2005	EXAMINER	
MCKENNA LONG & ALDRIDGE LLP			KIELIN, ERIK J	
1900 K STREET, NW			ART UNIT	
WASHINGTON, DC 20006			PAPER NUMBER	

2813

DATE MAILED: 05/16/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

H.A

<b>Office Action Summary</b>	<b>Application No.</b> 09/893,976	<b>Applicant(s)</b> KIM, IK SOO	
	<b>Examiner</b> Erik Kielin	<b>Art Unit</b> 2813	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 03 February 2005.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1,3-7,9-11 and 13-20 is/are pending in the application.
- 4a) Of the above claim(s) none is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1,3-7,9-11 and 13-20 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)  | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                                   | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |

## DETAILED ACTION

### *Continued Examination Under 37 CFR 1.114*

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 3 February 2005 has been entered.

### *Specification*

2. The amendment filed 3 February 2005 is objected to under 35 U.S.C. 132(a) because it introduces new matter into the disclosure. 35 U.S.C. 132(a) states that no amendment shall introduce new matter into the disclosure of the invention. The added material which is not supported by the original disclosure is as follows:

“The entirety of the protrusions of the source and drain electrodes is formed within the area of the active layer 44, as shown in Figs. 4 and 6C.”

Because the drain electrode 40 in Fig. 4 is shown to have two protrusions extending from therefrom and the uppermost protrusion shown in Fig. 4 is not formed entirely on the semiconductor active region, this amounts to new matter. Note that there exists nothing in the original specification addressing the extent of the drain electrode 40 or that the entirety of the protrusions of the source/drain electrodes is formed entirely within the area of the semiconductor layer 44, 46.

Applicant is required to cancel the new matter in the reply to this Office Action.

*Claim Objections*

3. Claims 1 and 11 are objected to because of the following informalities:

in claims 1 and 11, lines 8, 17, 18, and 19 of each, replace “the protrusion” with --the at least one protrusion-- for clarity. Appropriate correction is required.

*Claim Rejections - 35 USC § 112, First Paragraph*

4. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

5. Claims 1, 3-7, 9, 10, and 11, 13-20 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

Each of independent claims 1 and 11 recites the limitation that “the entirety of the protrusions of the source and drain electrodes is formed within an area of the semiconductor layer.” As indicated above in the new matter objection to the specification, there fails to exist support in the four corners of the disclosure for this feature as it is directly contradicted by Fig. 4, wherein the drain electrode is shown to have two protrusions the upper of which is not formed entirely on the semiconductor. Should Applicant argue that the upper portion is not a protrusion, then Applicant must provide **evidence** that it is not a protrusion. In the specification, the entirety of the feature labeled with reference character 40 is simply referred to as the “drain electrode.”

Art Unit: 2813

Applicant cannot therefore now argue --absent evidence to the contrary-- that only one of the protrusions (e.g. the lower protrusion of 40) shown in Fig. 4 is actually a protrusion while the other (e.g. the upper protrusion of 40) is not a protrusion --especially since there exists absolutely no discussion of this feature in the specification. Nor, as noted above, does there exist any discussion of the location of the electrode protrusions relative to the semiconductor layer, much less the criticality of such a feature.

***Claim Rejections - 35 USC § 112, Second Paragraph***

6. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

7. Claims 7, 17, and 18 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 7 depends from canceled claim 2 and is therefore indefinite.

Claims 17 and 18 depend from canceled claim 12 and are therefore indefinite.

For the purposes of patentability, the claim 7 will be interpreted as depending from claim 1 and claims 17 and 18 will be interpreted depending from claim 11.

***Claim Rejections - 35 USC § 102***

8. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

Art Unit: 2813

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

9. Claims 1, 9 and 11, 19, 20 are rejected under 35 U.S.C. 102(e) as being anticipated by US 6,545,291 B1 (**Amunson et al.**) considered with US 5,710,606 (**Nakajima et al.**) for a showing of inherency only.

Regarding independent claims 1 and 11, **Amunson** discloses a liquid crystal display device (col. 1, lines 14-29) and method of manufacturing the device comprising forming each of the following:

a gate electrode **110** on a substrate (Figs. 4A-4B);

a gate insulating film **140** on the substrate and over the gate electrode **110**;

a semiconductor layer **150** on the gate insulating film **140** and over the gate electrode **6**, the channel has and "Z"-shape, as shown in Fig. 4A;

a source electrode **130** (called "drain electrode" in **Amunson**; see "NOTE" below) and a drain electrode **120** (called a "source electrode" in **Amunson**; see "NOTE" below) on the semiconductor layer **150** and adjacent the gate electrode **110**, wherein the source **130** and drain **120** electrodes oppose each other and each includes at least one protrusion that extends toward the opposing electrode, and the protrusion of the source electrode **130** extends directly from a data line **330** and is therefore in electrical communication therewith --as further limited by instant claim 10;

a protective layer **150, 170** on the gate insulating film **110** and over the source and drain electrodes **130, 120**;

Art Unit: 2813

a pixel electrode 320 on the protective layer 170, the pixel electrode 320 (called “display electrode” in Amundson) electrically connected to the drain electrode 120 via a contact hole formed in the protective layer 170, as shown in Fig. 4B --as further limited by instant claims 9, 19, and 20--; and

wherein (1) an entire area of the “Z”-shaped channel is formed only over the gate electrode 110, as shown in Figs. 4A-4B --as further limited by instant claim 18-- and wherein (2) the gate electrode 110 underlies a part of the data line 330, the source electrode 130 and a part of the drain electrode 120 so that the “Z”-shaped channel is formed at parts of the source and drain electrodes facing the protrusion, and wherein (3) the entirety of the protrusions of the source and drain electrodes is formed within the area of the semiconductor layer as shown in Fig. 4B, and wherein (4) the protrusion of the source electrode 130 is parallel to and offset from the protrusion of the drain electrode 120, as shown in Figs. 4A-4B.

(See col. 1, line 66 to col. 12, line 39.)

NOTE: **Nakajima** teaches that the source and drains of thin film transistors in LCDs (Title) are equivalent, stating in pertinent part,

“The term of ‘source/drain region’ described means either one or both of a source region and a drain region. This term is used because both of these two regions 5 and 5 are substantially equivalent to each other, and the source and drain regions alternately exchange their functions with each other at a high frequency, in several types of devices.” (See **Nakajima**, col. 6, lines 14-19.)

Accordingly, the source and drain electrodes of **Amundson** are inherently equivalent and the names are therefore reversible.

Regarding claims 7 and 17, **Amundson** discloses that standard channel length (the distance between the source and drain electrode, equivalent to that indicated in the instant

Art Unit: 2813

specification) is from 10  $\mu\text{m}$  to hundreds of  $\mu\text{m}$  (col. 10, lines, 34-37). **Amundson** also states, and in accordance with the instant specification, that the channel width runs the distance of the zig-zap or "Z"-shaped channel (**Amundson**, Fig. 2B; instant specification, Figs. 2 and 5). Accordingly, the channel width is necessarily greater than 50  $\mu\text{m}$  when the channel length is hundreds of  $\mu\text{m}$ .

*Claim Rejections - 35 USC § 103*

10. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

11. Claims 1, 3-7, 9, 10 and 11, 13-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Applicant's admitted prior art (**APA**) in view of **Amundson**.

Regarding claims 1 and 11, **APA** discloses a liquid crystal display device and method of manufacturing the device comprising forming each of the following:

- a gate electrode **6** on a substrate **1**;
- a gate insulating film **12** on the substrate **1** and over the gate electrode **6**;
- a semiconductor layer **14** on the gate insulating film **12** and over the gate electrode **6**;
- a source electrode **8** and a drain electrode **10** on the semiconductor layer **14** and adjacent the gate electrode **6**, wherein the source and drain electrodes oppose each other and each includes at least one protrusion that extends toward the opposing electrode (the adjacent edges of the source and drain electrodes are form one protrusion, as shown in Fig. 3C --especially in the



Art Unit: 2813

cross-section) and the protrusion extends directly from a data line and wherein an entire area of the channel is formed over the gate electrode;

a protective layer **18** on the gate insulating film **12** and over the source and drain electrodes **8**, **10**;

a pixel electrode **22** on the protective layer **18**; and

wherein the gate electrode **6** underlies a part of the data line **4**, the source electrode **8** and the drain electrode **10** and a part of the drain electrode so that the channel is formed at parts of the source and drain electrodes facing the protrusion, **the entirety of the protrusions of the source and drain electrodes is formed within the area of the semiconductor layer**, and the protrusion of the source electrode is **offset** from the protrusion of the drain electrode, as shown in prior art Fig. 3C cross-section view. (Note: the adjacent edges of the source and drain electrodes form “at least one protrusion,” as shown in prior art Fig. 3C --especially in the cross-section-- and that the protrusions are necessarily “offset” in order to form the channel.)

(See instant specification, paragraphs [0003]-[0013] and Figs. 1 through 3E.)

**APA** does not teach that the transistor has a channel having a “Z”-shape with the width being greater than 50  $\mu\text{m}$  generated by the source and drain electrodes having a plurality of protrusions extending toward each other that are parallel and offset from each other.

**Amundson** teaches the benefits of improving transistor performance for displays, in general, including liquid crystal displays, wherein the source and drain electrodes **130**, **120** each include plural protrusions (Fig. 4A) that extend toward the opposing electrode and are parallel and offset from each other, in order to beneficially increase the channel width of the transistor to greater than 50  $\mu\text{m}$  --as further limited by instant claims 7 and 17-- resulting in a “Z”-shaped

Art Unit: 2813

channel having an entire area of the channel formed over the gate electrode **110** and over the semiconductor layer **150**. (See rejection in paragraph 9 of this Office Action.)

It would have been obvious for one of ordinary skill in the art, at the time of the invention to use the transistor configuration of **Amundson** as the transistor in **APA**, wherein the source and drain electrodes have protrusions extending toward each other in a parallel and offset manner so as to form a "Z"-shaped channel, in order to beneficially increase the channel width of the transistor, which enables reduction of the TFT size and "maximizes the aperture ratio," as taught by **Amundson** (Abstract).

Regarding claims 3 and 13, **APA** discloses the active layer **14** on the gate insulating film **12**; and the ohmic contact layer **16** on the active layer **14**.

Regarding claims 4 and 14, **APA** discloses that the ohmic contact layer **16** contains an opening corresponding to the channel **24** (Fig. 3C; paragraph [0009] --especially the last two sentences), but does not teach that the channel is "Z"-shaped.

**Amundson** shows that the channel is "Z"-shaped.

It would have been obvious for one of ordinary skill in the art, at the time of the invention to use a "Z"-shaped channel as the channel of **APA** to increase the channel width as taught by **Amundson**.

Regarding claims 5, 6, 15, and 16, **APA** discloses that the active layer is undoped silicon and the ohmic contact layer is doped silicon (instant specification, p. 4, paragraph [0008]).

Regarding claim 18, **APA** and **Amundson** each disclose that the channel extends only over the gate electrode **6**, **110**.

Regarding claims 9 and 19, **APA** and **Amundson** each disclose that the pixel electrode **22, 320** contacts the drain electrode **10, 120** through an opening **20** in the protective layer **18, 170** (Fig. 3E).

Regarding claim 10, **APA** and **Amundson** each disclose that the data line **4, 330** is in electrical communication with the source electrode **8, 130** (Fig. 3E).

Regarding claim 20, **APA** and **Amundson** each disclose that the pixel electrode **22, 320** is in electrical communication with the drain electrode **10, 120**.

### *Response to Arguments*

12. Applicant's arguments with respect to all pending claims have been considered but are moot in view of the new ground(s) of rejection.

### *Conclusion*

13. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

US 6,239,468 B1 (**Chang** et al.) assigned to the same assignee as the instant Applicant, LG. Phillips LCD Co. Ltd., discloses the same transistor having the "Z"-shaped channel (cover Fig.) as presently disclosed and claimed but was not provided to the Office by Applicant.

US 5,150,181 (**Takeda** et al.; Fig. 1B; col. 1, lines 6-30), US 5,576,555 (**Yamanobe** et al.; Figs. 1B, 4B), and US 5,705,411 (**Yamanobe** et al.; Figs. 1B, 4B) each discloses a transistor for an LCD having a "Z"-shaped channel resulting from source/drain electrodes having

Art Unit: 2813

protrusions that extend toward each other and the entirety of the protrusions is formed over the semiconductor active layer.

Re. 33,829 (**Castleberry**) discloses a transistor for an LCD having a "Z"-shaped channel resulting from source/drain electrodes having protrusions that extend toward each other.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Erik Kielin whose telephone number is 571-272-1693. The examiner can normally be reached from 9:00 - 19:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Carl Whitehead, Jr. can be reached on 571-272-1702. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Erik Kielin  
Primary Examiner  
May 12, 2005